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Influence of conventional biochar and ageing biochar application to arable soil on soil fertility and plant yield

Helena Dvořáčková, Jaroslav Záhora, Jakub Elbl, Jindřich Kynický, Jan Hladký, and Martin Brtnický

Mendel University, The Faculty of Forestry and Wood Technology, Pedology and geology, Brno, Czech Republic (helenadvorackovaa@gmail.com)

Biochar represents very controversial material which is product of pyrolysis. According to many studies biochar has positive effect on physical and chemical properties such as pH, conductivity, aggregates stability etc. Unfortunately biochar is product of combustion, so it can content toxic substance as are aromatic compound. These substances may have a negative effect on yield and microbial activities in soil. Our aim was eliminated concentration of toxic compound but preserved positive effect of biochar on soil properties. We was ageing/ activating of biochar in water environment and for soil inoculum we used native soil from landscape. Moreover two types of biochar was tested by pot experiment with seven variants, where conventional biochar from residual biomass and ageing biochar were applied in different doses: 10 t/ha, 20t/ha and 50 t/ha. Pots were placed in green house for 90 days and after the end of experiment the following parameters of soil fertility, health and quality were evaluated: content of soil organic matter, arbuscular mycorrhizal colonisation of Lactuca sativa L. roots, leaching of mineral nitrogen, changes in plant available nutrient content, EC and pH. Above all the total yield of indicator plant was observed.

The significant ($P < 0.05$) differences in plant yield and soil properties were found. The application of conventional biochar didn't have positive effect on plant yield in comparison with ageing biochar. The positive effect of ageing biochar addition on soil fertility was directly proportional to the dose which were applied – increasing in dose of ageing biochar resulted in increase of plant yield. Moreover the special experimental containers were used, where we was able to monitor the development of root in soil with and without addition of biochar (conventional or ageing). The positive influence of ageing biochar addition into soil on development of Lactuca sativa L. roots was observed.